



RAIN GARDEN SOILS

Charles “Chuck” Jarman, P.E.
Water Resources Engineer
November 5, 2015



WELCOME



Chuck Jarman, P.E.

Water Resources Engineer,
Clemson Extension Service





Contents

Soil Triangle

Soils

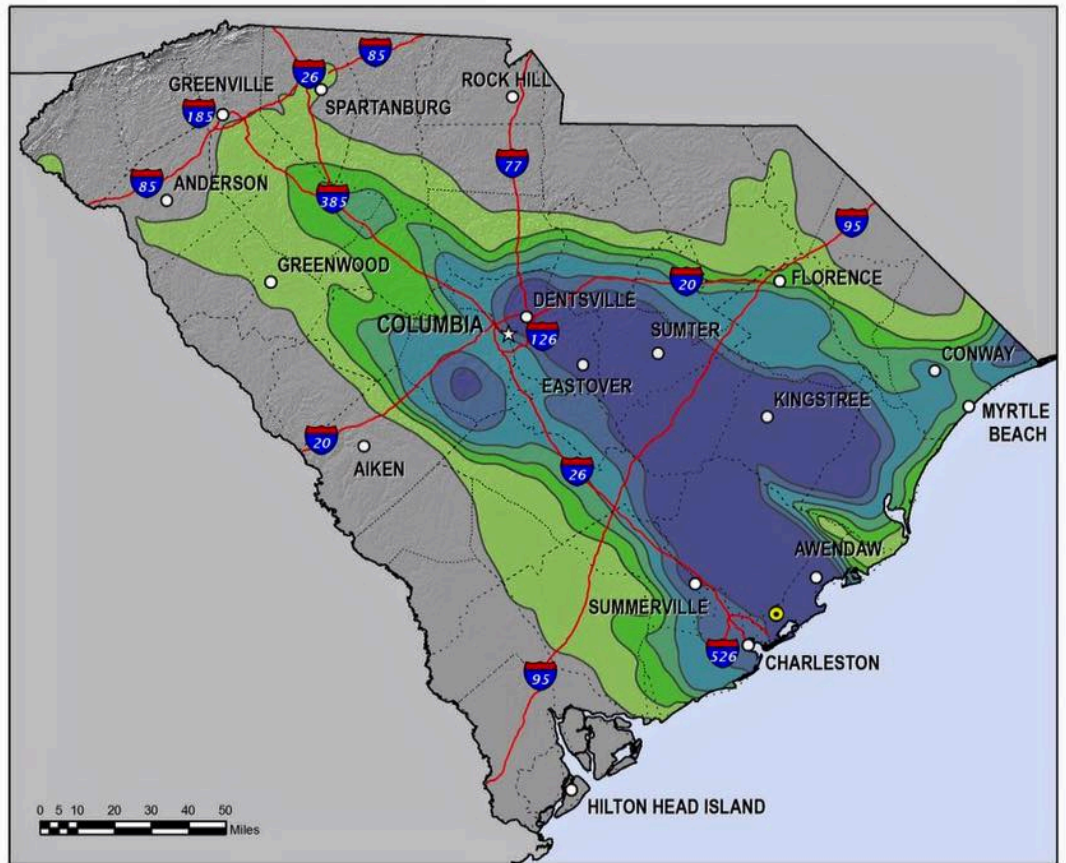
Perk Test

Ribbon Test

Jar Test

Rain Garden Sizing





South Carolina Annual Exceedance Probabilities (AEPs) for 72-hour Rainfall 2 - 4 October 2015

Hydrometeorological Design Studies Center
National Water Center, National Weather Service
National Oceanic and Atmospheric Administration

<http://www.nws.noaa.gov/ohd/hdsc/>



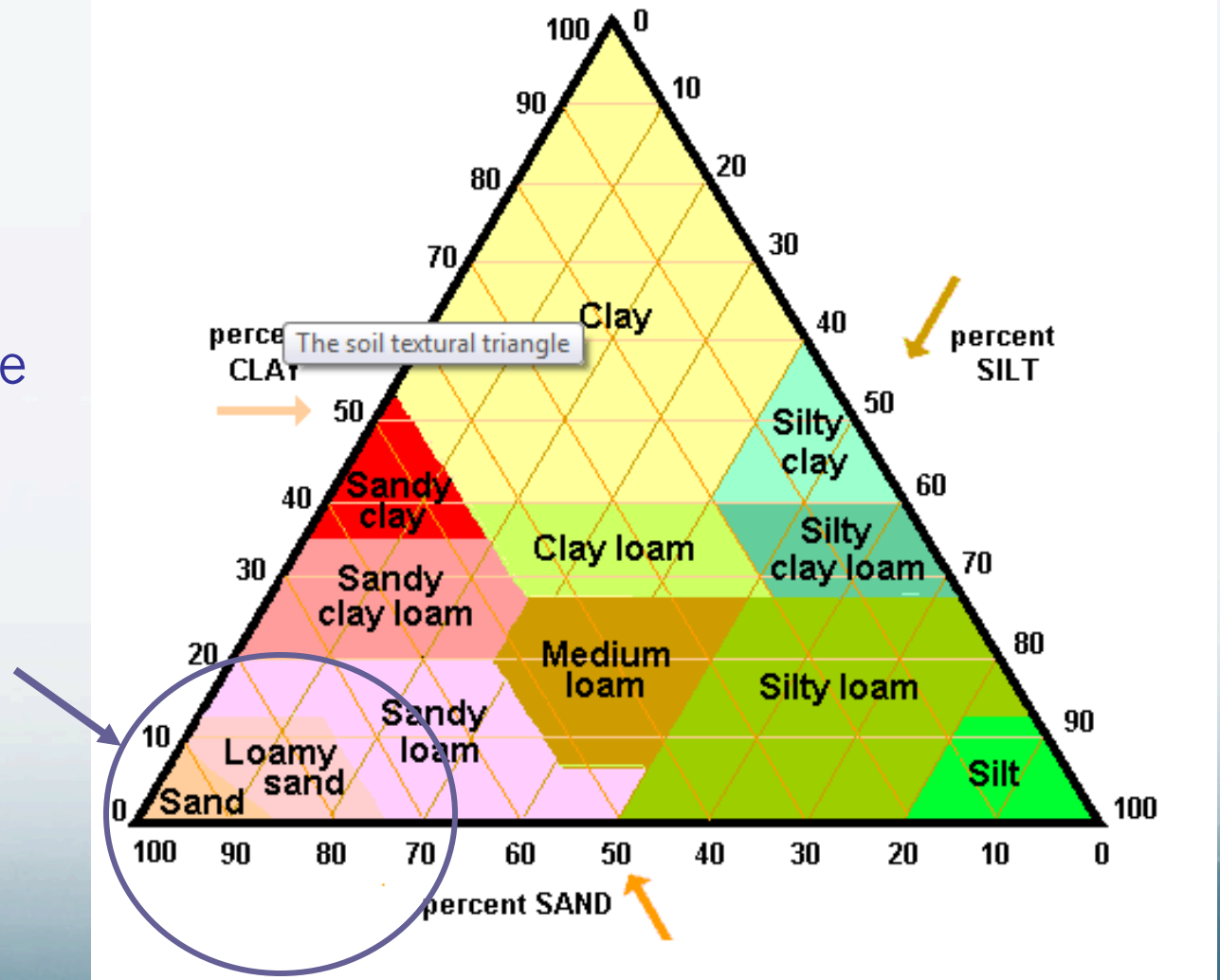
Created 6 September 2015
Precipitation frequency estimates are from NOAA Atlas 14, Volume 2, Version 3.
Rainfall values come from 6-hour multi-sensor data.



- > 1/10
- 1/50 - 1/10
- 1/100 - 1/50
- 1/200 - 1/100
- 1/500 - 1/200
- 1/1000 - 1/500
- < 1/1000

What type of soils?

Sandy loam or loamy sand is the most recommended rain garden mix. Amend the native soils by tilling sandy loam into your soils on site.



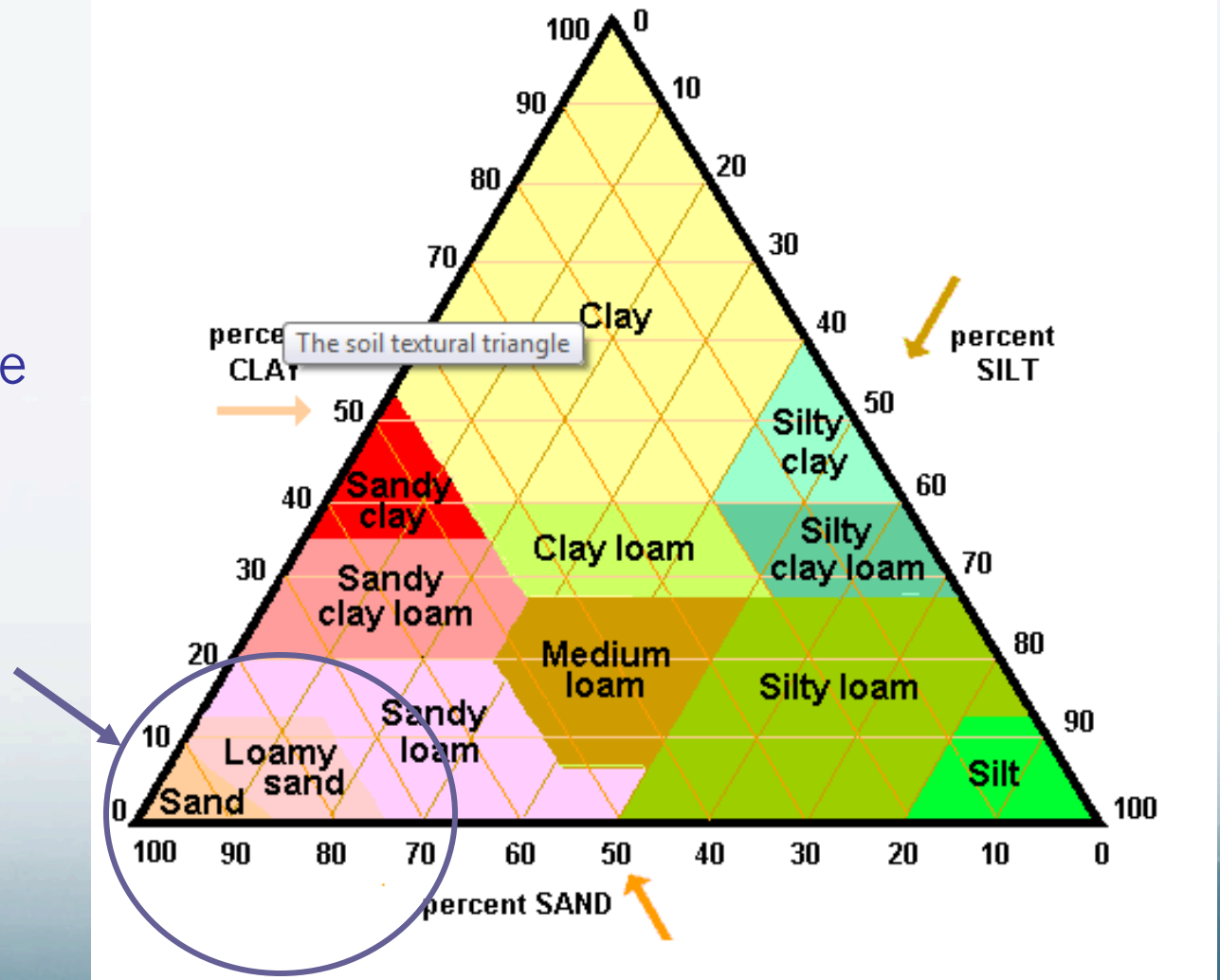
Soil Particle Size

- Clay: Particles have a diameter of less than 0.002 mm
- Silt: Particles have a diameter between 0.002 mm and 0.05mm
- Sand: Particles have a diameter larger than 0.05mm



What type of soils?

Sandy loam or loamy sand is the most recommended rain garden mix. Amend the native soils by tilling sandy loam into your soils on site.



Jar Test



Jar Test

Fill the jar half full of soil, then add water to the top.

Shake vigorously until you have a uniform slurry.

Stop shaking and in 5 seconds mark the line where soil has settled out (sand).

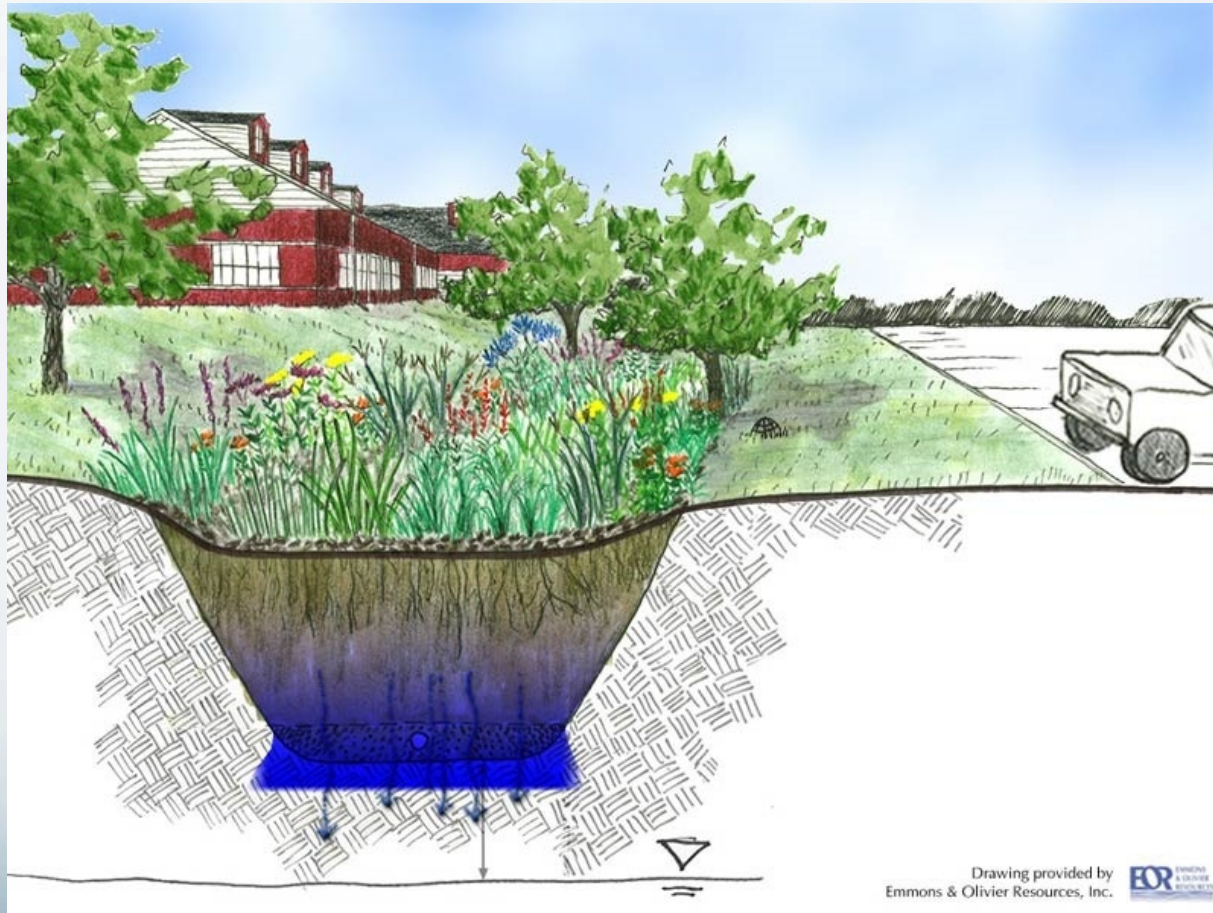
Put the jar down and wait 30 minutes mark the line where soil has settled out (silt).

Let the jar sit for several day mark the line where the soil has settled out (clay). Note: Clay particles can stay suspended for lone periods of time.

The organic matter will generally float and accumulate on top.



Rain Garden



Importance of Soil Mix

- Essential for determining flow control and water quality treatment.
- Soil mix should balance 3 design objectives
 1. Infiltration rate high enough to handle drawdown
 2. Infiltration rate low enough to optimize pollutant removal
 3. Serve as effective growth media to support plant health and water quality treatment

Soil Mix Guidelines

- Great deal of variation among recommended “recipes”
- Ideally, 1-6” per hour drainage.
- In general
 - **Sandy loam or loamy sand**
 - Organic matter content of at least 10%
 - < 5% silt or clay (fines)



Perk Test



The Perk Test

What is percolation?

1. Dig 1.5' deep, 1 shovel wide
2. Fill the hole with water
3. Estimate drainage time
4. Should drain within 24 hours!



The Perk Test

Drain Time	Appropriate BMP
< 12 hours	Standard Rain Garden
12 - 36 hours	Zoned Rain Garden
36 hours – 4 days	Drought-tolerant Wetland
> 4 days	Wetland

Note: These are small-scale rain gardens and wetlands. Larger projects designed for regulatory purposes require design and approval by a P.E.

Amendments & Drainage



If water is still there after 24 hours, consider wetland garden.



What is the best soil mix for our rain garden?

- Consider the existing soil for drainage and organic content (perk test, ribbon test, jar test)
- Rain garden soil mix:
 - Sand: 50%
 - Compost: 20-30%
 - Top soil: 20-30%
- Mix well in the excavated area, like baking a cake!
- If have existing highly sandy soils, might be able to avoid adding sand.
- If have high clay soils (but still perk) but avoid adding sand and add compost only.



Determining Soil Texture On Site

1. Collect a small handful of final soil mix. Add enough water so that it can form a ball.
2. Press soil gently between thumb and forefinger, trying to stretch out a ribbon.
 - If the soil is sandy, you will not be able to make a ribbon.
 - If you can make a ribbon, notice identifying characteristics.

Ribbon Test

Sand

Will not form a ribbon and has a sticky, grainy feel.

Sandy loam

Will form a ribbon $<0.5''$ and feels gritty.

Clay loam

Will form a ribbon $<0.5''$, feels smooth and only slightly sticky.

Clay

Will form a ribbon $>1''$ and feels smooth and sticky.



Jar Test



Amending Soils







What size should our rain garden be?

1. Determine the area of impervious runoff source (rooftops + sidewalks + driveway areas)
2. Rule of thumb: estimate the size of your rain garden based on soil types:

Sandy soil (well-drained)
= 20% of impervious area

Loamy soil (poorly-drained)
= 30-50% of impervious area





**25 feet x 25 feet=
625 square feet of roof catchment area**



To calculate 20%, simply multiply by .20
625 sq ft of roof area x .20= 125 sq ft

Rain Garden Area
is 125 square feet,
20% of the roof
catchment area.

12.5 feet long

10 feet wide





Loamy soils drain more slowly!
Rain Garden needs to be at least 30% of
roof catchment area



To calculate 30%, simply multiply by .30
625 sq ft roof area x .30= 188 sq ft



Contact Information

Charles C. Jarman, Jr., PE

Water Resources Engineer

1250 Supply Street

North Charleston, South Carolina 29405

(843) 730-5102

cjarman@clemson.edu



Thank You!!!

